FLOOD EARLY WARNING SYSTEM
FOR INSUFFICIENT OBSERVED RIVER BASIN
USING GLOBAL & IN-SITU OBSERVATION DATA

May. 29, 2014

The 10th GEOSS IGWCO COP MEETING

Koshiba Hall, UT

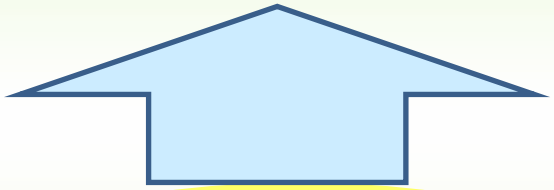
YOICHI IWAMI

ICHARM (International Center for Water Hazard and Risk Management)

under the auspices of UNESCO hosted by PWRI, Tsukuba

ICHARM: Our Philosophy is Localism

Delivering best available knowledge to local practices



UNISDR GP-GAR

IRDR

UNESCO Centers

IFI

WWAP, AWDO

IFNet/GFAS

WWF, APWF

GEOSS AWCI

Sentinel Asia

Efficient information networking

Working as a Knowledge Hub on W&D through Technical Assistance
Supported by ADB & UNESCO

Mission: to serve as

Global COE for Water Hazard and Risk Management by observing and analyzing natural and social phenomena, developing methodologies and tools, building capacities, creating knowledge networks, and disseminating lessons and information in order to help governments and all stakeholders manage risks of water-related hazards at global, national, and community levels.

Flood Alert system
Hazard mapping
(IFAS, BTOP, RRI models)

Effective capacity building

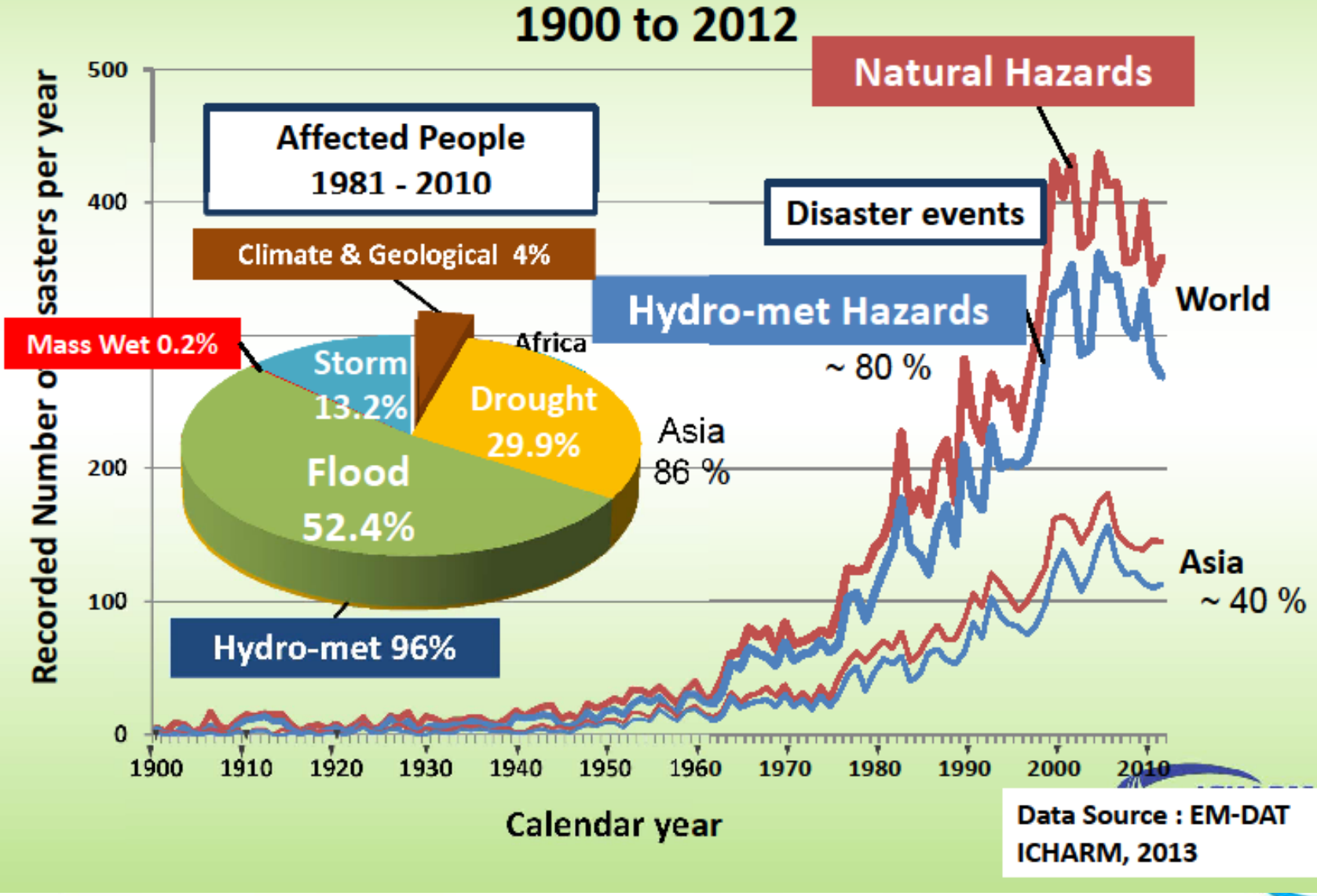
Innovative research

- Master Course
  Hazard Mapping Course
  River & Dam Course
  Supported by JICA
- Ph.D. Course

Flood Preparedness Indicators/Standard

Flood & drought risk assessment under climate change
Supported by MEXT (Sousei Program)

Increasing & Evolving Disasters



○ Challenges in developing countries

Insufficient observed data (past and real time data)

→ Difficulty of flood forecasting

Can not assess flood risk

Can not plan useful countermeasures for the future

Limitation of budget

→ It takes long time to develop infrastructures to prevent and mitigate flood disaster

Need for cost to install flood forecasting system

Need for capacity building to manage and maintain necessary systems

○ Technical innovation

Global dataset is available (tentatively used during in-situ data are not available)

→ Global map (Elevation, Geology, land use)

→ Satellite rainfall data

Advancement of numerical ability

→ Distributed runoff model with parameters determined by grid based information can be applied in a short calculation time

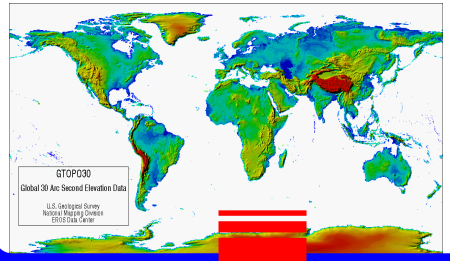
Concept of IFAS (Integrated Flood Analysis System) development

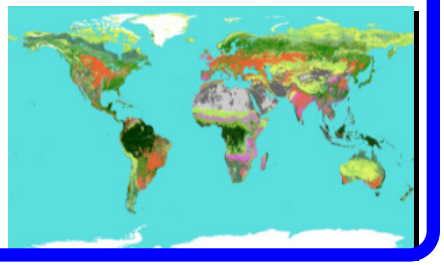
Concise input hydrological analysis software for insufficiently gauged large basins

- All-in-one package with GIS and GUI functions for creation of runoff river network, model parameterization, flow simulation and displaying output results
- Links to global GIS datasets for model building and parameterization
- Flexible system to accommodate both satellite rainfall data and ground-gauged data (radar data if necessary)
- Educational tool: you can learn hydrological meanings from IFAS (It is not a black box model)
- **Free distribution** (Download from ICHARM website)

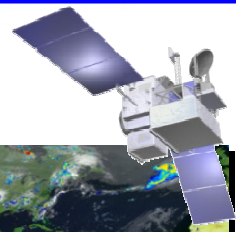
Early Warning System - IFAS for insufficient observed basin

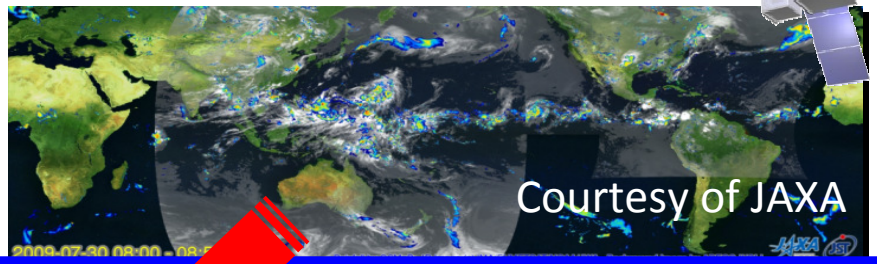
Global data: topography, land use, etc.





Import satellite rainfall and ground-gauged data



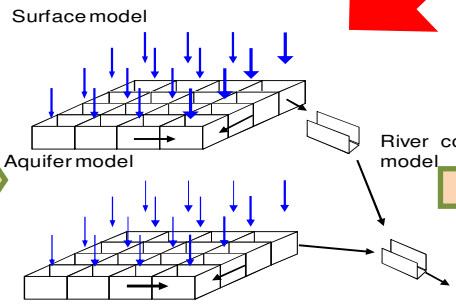


input

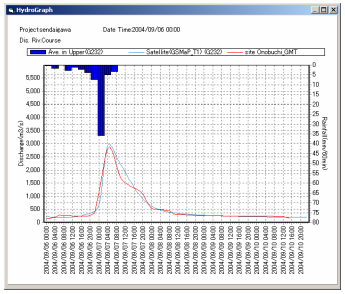
input

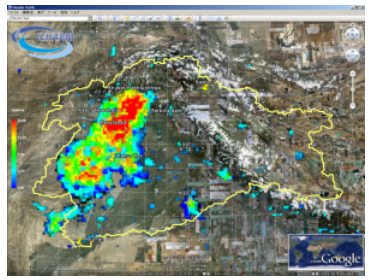
Run-off analysis by PWRI
distributed tank model

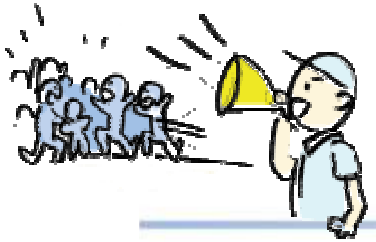
Model creation



Output: River discharge, Water level, Rainfall distribution







Judge by River management authorities

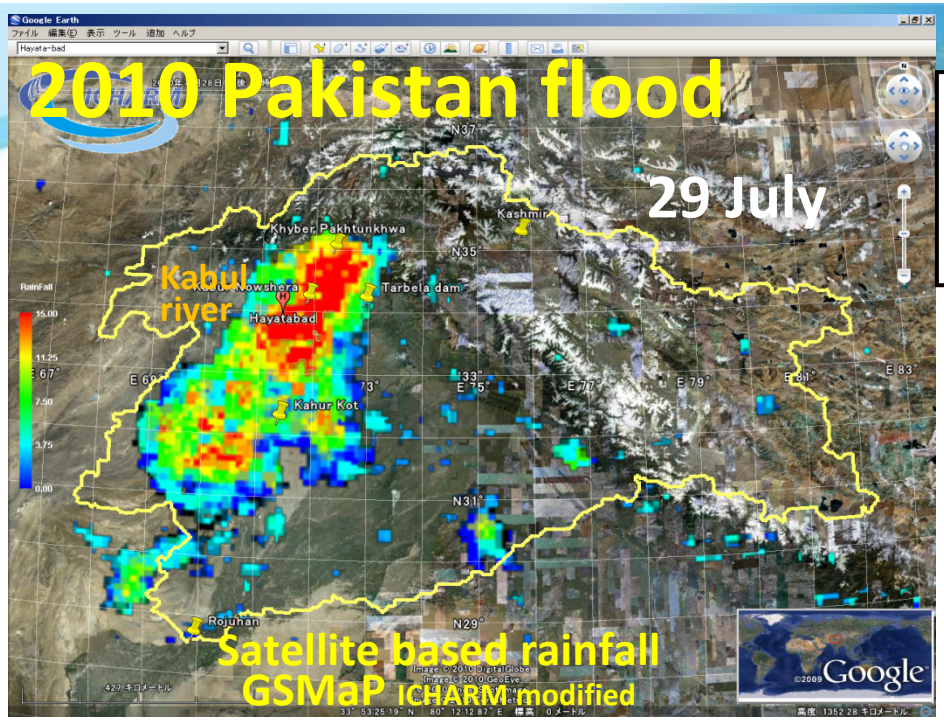
Alert message by E-mail

and on the display for river management authorities

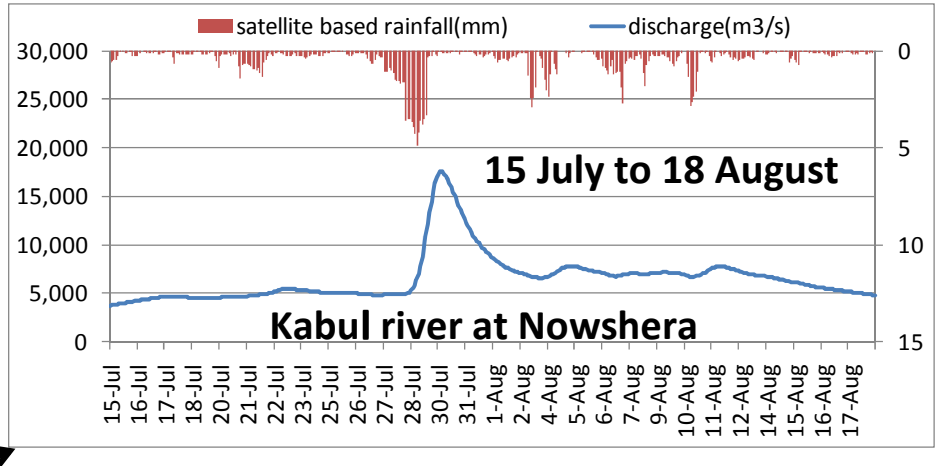
Discharge reaches warning level

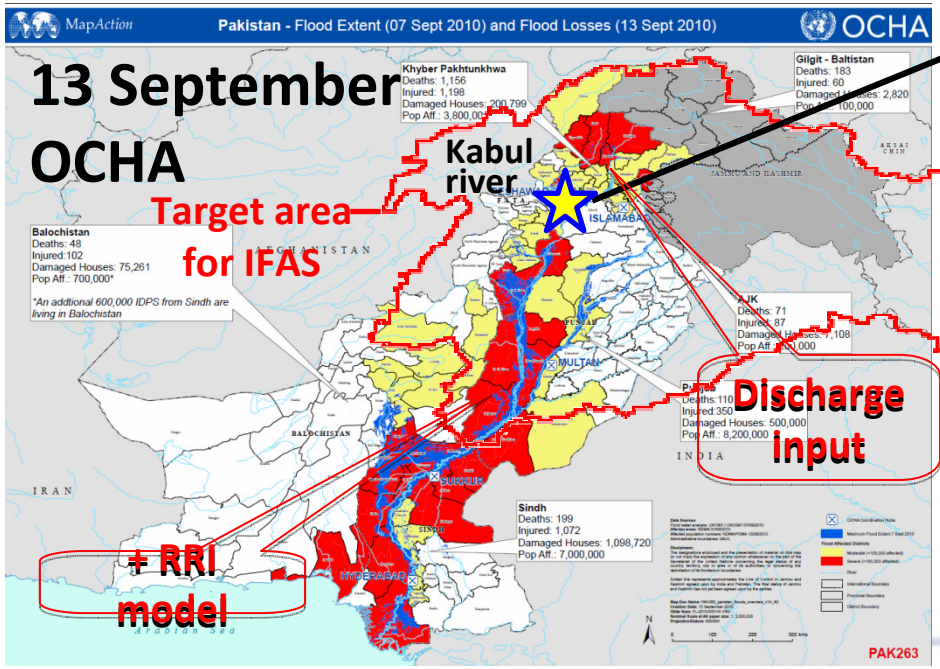
Evacuate from dangerous areas

2010 Pakistan flood



UNESCO Project (2 years: 2012-14)
Strategic Strengthening of Flood Warning and Management Capacity of Pakistan



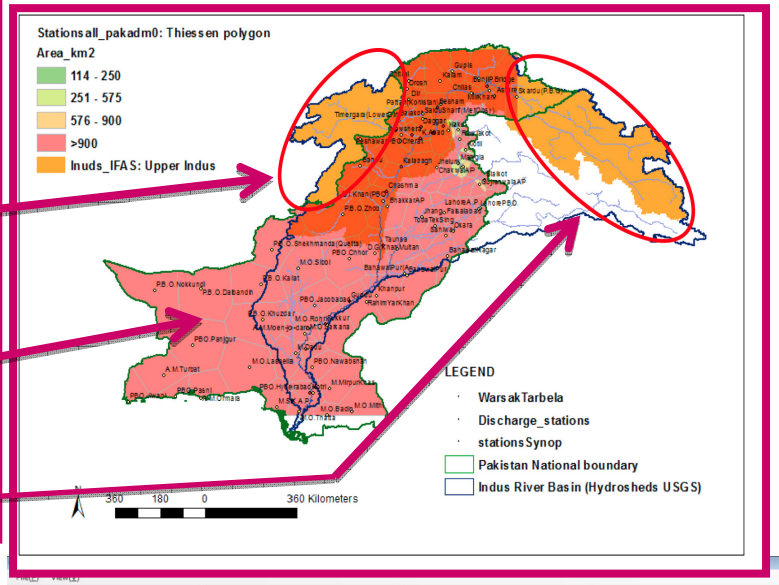


GSMaP (satellite rainfall data) is useful in the upstream of Kabul river basin with no rain gauges. GSMaP should also be calibrated.

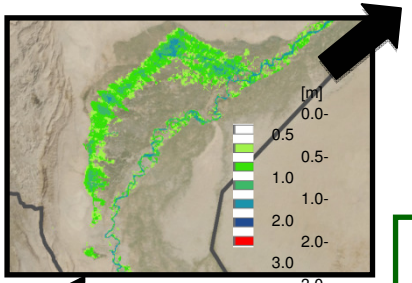
Indus-IFAS: flood forecasting system based on IFAS / RRI (UNESCO-Pakistan project 2012-13)

INPUT DATA CHALLENGES:

- *Lack of trans—boundary data*
- *Null-Low rain gauges network density*
- *Uncertainty on snowmelt*



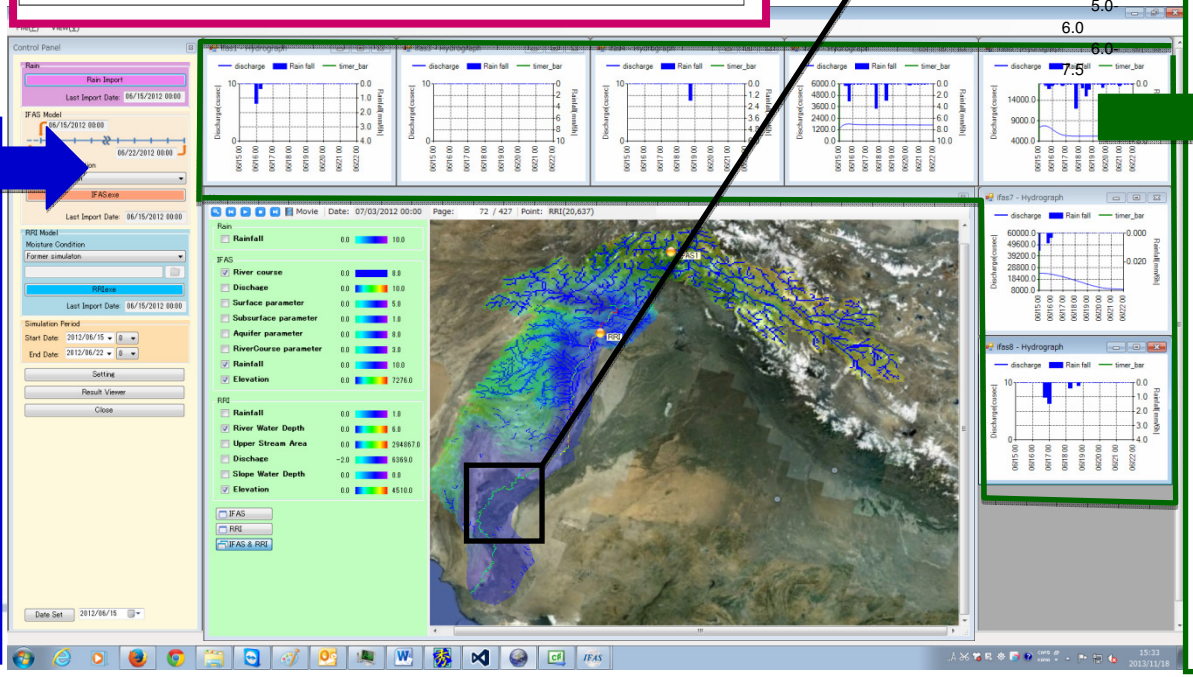
Inundation area by RRI



FLOOD HAZARD MAPPING

INPUT DATA :

- Rainfall data (PMD ground-gauges, GSMaP and forecasted)
- **Real-time observed discharges**



OUTPUT DATA:

- Rainfall distribu-tion maps
- Hydro-graphs at specified locations
- Inundation extents in mid-low Indus

Capacity Building for Pakistan (2012-13)

6 Pakistani officers (PMD, SPARCO & IPD) graduating from ICHARM/GRIPS MSc

Short- training in Japan of 11 Senior Managers from Pakistan

ICHARM participation to international Workshop and Training in Pakistan

Indus-IFAS training at FFD Lahore

IFAS Training for ASEAN countries by JICA/AHA center

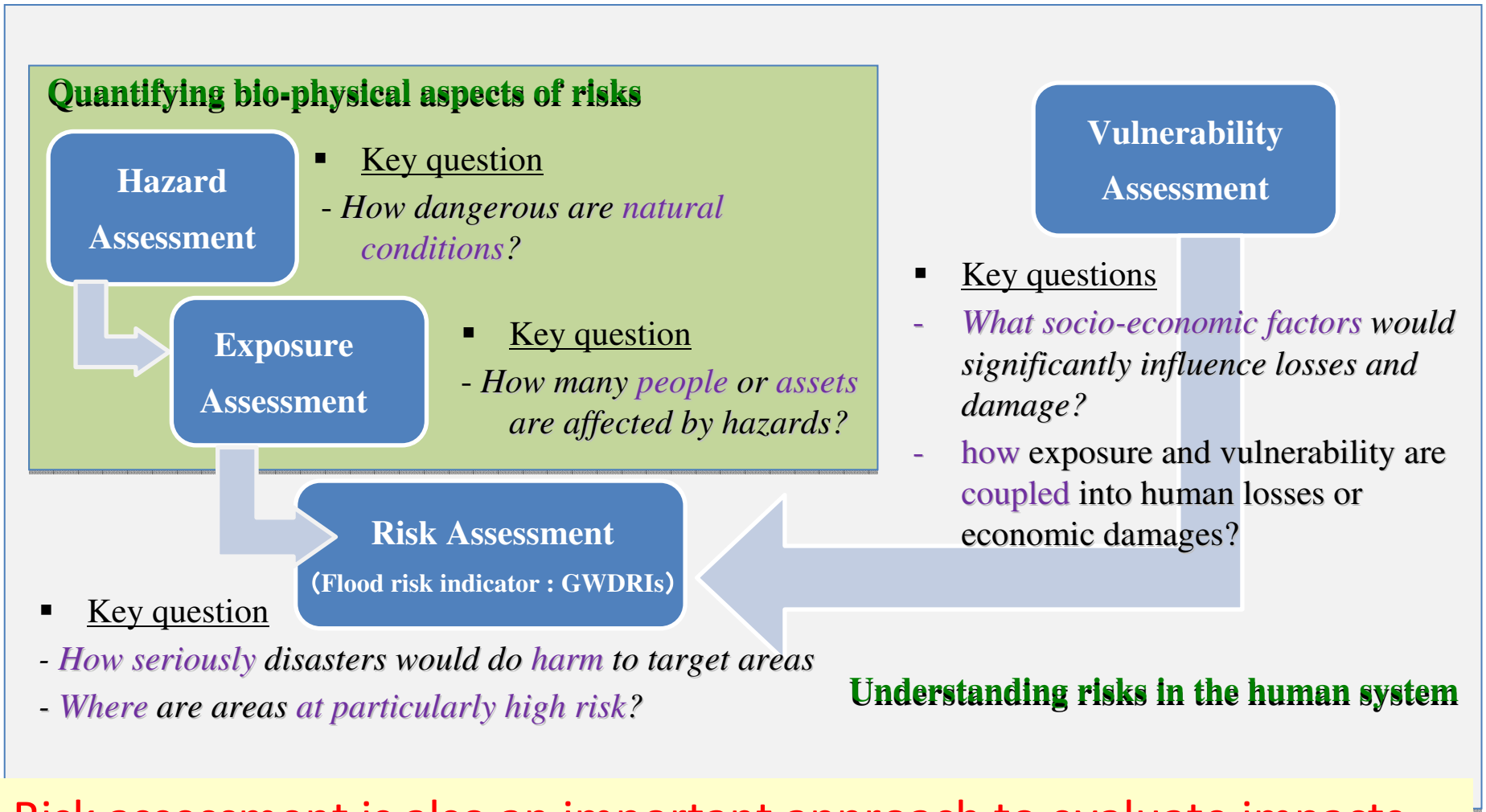
"Capacity Development for Immediate Access and Effective Utilization of Satellite Information for Disaster Management"

on September 9-12, 2013 at the AHA Centre (ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management) in Jakarta

18 participants from 10 countries
(Singapore, Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand and Vietnam)

GLOBAL FLOOD RISK INDICES

ICHARM Challenges for contribution to Hyogo Framework for Action 2 & post-2015 MDGs



Risk assessment is also an important approach to evaluate impacts of climate change and to study adaptation measures.

Summary / suggestions

- Observation systems are very important to store and analyze basic data such as rainfall, water level, water discharge as well as topography, soil data in the basin. These data are useful to use hydrological simulation model to predict flood occurrence for early warning (evacuation and flood fighting activities) and also make a comprehensive river management plan.

- Global data are useful for insufficient observed area as input data for flood forecasting. Satellite observed rainfall data need calibration with ground gauged data. As collecting in-situ data step by step, the accuracy of flood forecasting becomes much higher.

- Risk assessment researches based on the observed data are also important for climate change monitoring and adaptation.


Thank you
for your kind attention